

SYSTEM, METHOD AND APPARATUS FOR CONVERTING AND INTERGRATING MEDIA FILES

by inventor(s)

5

Raffaele Sena, Cupertino, CA, Nathaniel D. Monson, Mountain View, CA, Kevin M. Lynch, Los Altos, CA, and Keith Kitani, San Jose, CA

FIELD OF THE INVENTION

10 [0001] This invention relates generally to digital media conversion and integration. More particularly, the invention teaches automated systems which allow multimedia presentations to be derived from one or more multiple digital media files and are delivered in a desired format through the Internet or software download.

BACKGROUND OF THE INVENTION

15 [0002] There are many formats for various digital media files which include sound, video, and presentation files. Many of these formats are dependent on the type of software in which the media file was created. For example, a very popular presentation software program called POWERPOINT® created by Microsoft corporation for the personal computer was developed and marketed in the early 1990s. This presentation program integrated text, pictures, diagrams, and graphs into a set of frames, commonly called "slides," which could be "played"

20 back sequentially either manually or timed to create a presentation. In the first embodiments, the capabilities of this software were limited; however, with the progress of computing power, memory and digital media compression techniques, the presentation software began to assist in developing traditional business presentations.

[0003] The POWERPOINT® and other software system is represented by prior art FIG.

25 1. Other integrated presentation software was made by other manufacturers such as Claris (CLARIS, etc.), Harvard Graphics, and Persuasion. A typical presentation consists of 3 active screens 100, 120, and 140 and two pause screens 110 and 130 over five time periods T1-T5. Screen 100 is composed of text 102 and a picture 104, screen 120 is composed of a picture 122 and a graph 124, screen 140 is composed of a histogram 142 and a body of text 144.

30 [0004] As demand for information increased, multimedia presentation software programs began to replace some more traditional forms of media like print and video and even the in-person business presentation. Needless to say, with the advancement of the Internet, graphics, text, sound and video presentations, demand increased for information services. Although a presentation file could be downloaded from an Internet site or sent via email, presentation

35 software like Powerpoint® could not be displayed over the Internet in a multimedia format.

[0005] Although Powerpoint® now has a built-in feature which allows a user to add a sound file to an individual frame, this add-in procedure requires that the user will have broken up

each sound file into the appropriate length for the frame. This procedure can be extraordinarily time consuming and require an average user to develop advanced multimedia production skills in order to add a simple sound file to a "slide."

5 [0006] Other multimedia software such as QUICKTIME® developed by Apple computer, REAL PLAYER®, developed by Real Networks or MICROSOFT MEDIA PLAYER® developed by Microsoft can integrate digital video and sound while making a media file accessible over the Internet. However, these proprietary formats must be created by complicated multimedia editing software programs. Quicktime® can also incorporate many times of media file formats into the Quicktime® file, presented on the Internet. However, these files must all be
10 extensively authored and incorporated manually by a Quicktime® authoring software user. A Quicktime® file creation schematic is depicted in FIG. 2. A virtual player is typically composed of a screen 150 a virtual viewing area 152 and virtual controls 154 which control the direction and speed of the video or presentation.

15 [0007] There are currently computer software products which allow for some conversion of digital video and audio media in an authoring capacity only. Such software products are prohibitively expensive for consumers and extremely complex to learn and generally designed for multimedia production professionals only. An example of this is MEDIA CLEANER® published by Media 100, Inc., represented by FIG. 3. This multimedia computer program allows
20 a web professional to take digital videos in several basic formats and turn it into a specific digital video format appropriate for web publishing and streaming.

[0008] Media 100 also has software which converts digital audio with digital sound (Data translation of Marlboro, MA currently holds US Patent No 5,506,932, a system for synchronizing
25 digital video to digital audio) which is represented by FIG. 4. However, such software tools meant for authoring Internet multimedia documents and are geared towards use by highly trained multimedia professionals. Other similar computer software programs allow digital video to be put into the Quicktime®, Microsoft Media Player® and Real® or MP4 formats. The proprietary nature of these software authoring products is useful for the media production professional, but is
30 clearly not designed for the average consumer needing a multimedia business presentation quickly and inexpensively.

[0009] Additionally, these multimedia computer programs use virtual media software called "players" and need to be installed onto a personal computer in order to play back the
35 proprietary multimedia files. Often these players are very large computer programs which have to be downloaded from a proprietary Internet site or installed by CD-ROM. Most of the products cost money and take time to download. Although Internet connections are getting faster, if a viewer does not have a particular proprietary media player installed on their computer they may not wait to take the necessary steps to view a presentation. For example, if a business wanted to

place a promotional multimedia digital file on its Internet site, they would need at least three formats because the different multimedia formats are not compatible with each other and must be posted and downloaded separately in order to reach a variety of customers using the various software formats, such as Real, Windows Media, Quicktime, etc. This could be extraordinarily expensive and time consuming as well as create an Internet site that uses more computer memory and looks confusing.

[0010] Not only does dependence on one type of multimedia format give rise to logistical problems in getting multimedia information to consumers, there are also serious antitrust and free market considerations as well. These software market problems may severely limit the ability of consumers to choose the media format they most prefer as opposed to the media player format that currently dominates the software market.

[0012] Currently, there are many types of digital media formats, which can be divided into proprietary software formats and platform formats. Proprietary software formats can only be utilized by a specific company software, like the Real® and Window Media® “players” described above. In contrast, platform formats are software format standards usually developed by a group of industry experts. Such media formats include JPEG, MP3, etc. and usually cost nothing to use, because they are developed in the “open platform” setting. The Internet presentation languages XML and DHTML are languages that have been developed in an “open platform” setting and are therefore free for programmers to use (although programmers in these languages may choose to purchase a particular version).

[0013] It is important to note that unlike popular word processing computer programs or spreadsheet computer programs, there are not easy conversion options for these multimedia player files. Therefore, a Microsoft Word® computer program will be able to open a Wordperfect® document, but a Real player® will not be able to open a Quicktime® or Powerpoint® file for viewing.

[0014] In addition to the commercially available multimedia formats, several companies offer software products in which a viewer can use the company’s own “player” to view a multimedia file. In almost all instances, this is the only way in which the final digital media format can be viewed. Companies that are using this type of technology include: Digital Lava, Eloquent, Brainshark, Loudeye, and Presenter.com.

[0015] Instant Presentation™ developed by Presenter.com, is a product that allows a consumer to integrate voice/sound with a Powerpoint™ presentation. In contrast to the present invention, the voice/sound file is integrated by telephone and therefore is limited in the number of ways that sound be applied to the presentation. The 2.0 version of INSTANT

PRESENTATION™ appears to have some customizing capabilities for presentations and allows a consumer to track the amount of times the presentation has been viewed. However, the INSTANT PRESENTATION™ product does not break down digital media into components, but captures images as a whole, which limits the types of conversions that this product may perform and the number of “players” that this product supports.

[0016] Digital Lava produces a multi-media product called “FIRE STREAM,” which runs on an open-ended architecture. This product allows multiple media technologies can be integrated and the HOTFOOT™ product from Digital Lava integrates sound and animation for Powerpoint® which can then be accessed by a viewing consumer. Like the above-discussed INSTANT PRESENTATION™ this product does not break down a digital media file into its low-level constituent components and is therefore limited in the number of types of conversions that it can perform. Eloquent appears to be using an open ended architecture for a “rich media” player. This software product is limited in the same way the above products in that it does not break down the digital media file. The end multimedia product created by this software must be viewed on a large Eloquent player plug-in. This product does not appear to have a fully automated solution which will allow self-service recording to turn into an Internet ready presentation. The Brainshark™ product is limited in the same manner that it does not decompose a file into the constituent components, even though it allows a user to record a voice over the phone to synchronize to a Powerpoint® presentation.

[0017] Loudeye’s MEDIA SYNDICATOR, is introduced as both a product and a service. Also, it looks like it is primarily designed to sell and distribute streaming media to consumers for syndication and consumption through e-commerce, which is not in the same industry as the present invention, nor is a conversion system. Real Producer® is another software product that will allow delivery of a presentation, but it will create output for only one type of player.

[0018] As would be appreciated by one skilled in the art, the above discussed products require more bandwidth to execute the delivery of presentations because the non-decomposed files require more bandwidth than files that have been broken down into their base components.

[0019] What is needed is a combination of software and hardware which can automatically break down a variety of digital media into component elements such as text, fonts, shapes, pictures, videos, etc., especially animations, so that the digital component data can be recreated in a multiple of presentation formats for various viewing devices, such as web browsers, PDAs, set top boxes, and mobile telephones. In addition, this combination of software and hardware should not absolutely require proprietary software or absolutely require a viewing consumer to have the viewer or plug-in in order to see a digital media presentation. What is also

needed is a method for treating a digital media presentation so that the bandwidth needed to deliver such presentations is reduced.

SUMMARY OF THE INVENTION

5

[0020] The present invention addresses many of the above-listed problems by providing an integrated system, method and apparatus for converting and integrating multiple digital media files including proprietary software file formats, into a single desired digital multimedia format, which can viewed as a presentation over the Internet or played on a personal computer. The subscriber or user can choose the output presentation from a variety of formats. The present invention uniquely breaks a digital media file into its components, so that it may be reconstructed into a many formats and delivered to a user with only the necessary components. The minimalization in the number of digital media components needed to deliver a presentation reduces the bandwidth needed to deliver such a presentation.

10

15

[0021] The preferred embodiment of the invention allows a user to choose from a variety of output formats of the integrated digital media format and then prompts the user to upload the media files that are to be changed into the presentation file. The invention then allows the user to upload the user's file inputs, such as Powerpoint®, animation, or audio file, screen the files, load the digital media files into a conversion engine through the Internet, and convert and integrate the digital media files into the user's desired output format. The invention also includes a system for the creation of a generic web presentation format from the converted output format which may be accessed by multiple users through the Internet or a corporate intranet

20

25

[0022] Although one embodiment of the present invention utilizes a special media plug-in to allow a third party to view the output presentations via the Internet, it is not necessary to load a proprietary plug-in onto a computer to achieve the final desired output for viewing. It is a feature of the present invention that allows a user to choose if they want a media player output feature. Hence the invention does not require a viewer to have software, other than a web browser, installed on a personal computer before viewing the output format.

30

35

[0023] An alternate embodiment of the invention also provides a specific Internet presentation software authoring tool for combining a proprietary software digital media file such as Powerpoint® with any digital media file. This file integration software may be executed on a personal computer with substantially less effort than existing proprietary technology. The integrated file is then delivered to the above-discussed presentation publishing system and allows the presentation file to be viewed as a web presentation for third parties via Internet access, intranet access, or email.

40

[0024] The present invention is far more cost effective than other web presentation versions of multimedia files that are created manually. Hence, the automated presentation capabilities of the present invention make it far more efficient and less expensive to implement

and update than the above listed art, where such competitors are performing these tasks manually or using multiple server components including a telephone server.

5 [0025] These intermediate digital media files can then be integrated by a transformation module. This integration may or may not require a special digital signal in order to synchronize the multiple digital media input, but such a “synchronization signal” can be added by the transformation engine in order to facilitate integration.

10 [0026] In an alternate embodiment the invention converts the media input files directly to the desired output formats without first converting the input files to intermediate digital media files. This can be accomplished by uploading files to a specific Internet site which then downloads them into the present invention.

15 [0027] The integration of the individual digital media files may be executed on a server by uploading the digital media files to the server from a personal computer, or by running the software on a personal computer where the digital media files are stored (as in the “Presedia Producer” software product).

20 [0028] After the multiple digital media inputs have been integrated into a single multimedia digital file, the invention converts the multimedia digital file into various formats which can be accessed by a consumer. The invention then allows the user to publish the multimedia file on a web-accessed server for multiple user access via the Internet from any location that has web access. The consumer may also download the multimedia presentation to a computer from a server.

25 [0029] The present invention enables a consumer to view the new integrated digital media presentation without requiring a specific software “player” or viewing platform. This is in contrast to some of the technology discussed above in the prior art. Although the applicant’s invention teaches a method of delivery though the Internet to both the user consumer and viewing consumer, Internet or network delivery is not a necessary part of the present invention. The invention also teaches future plans for an automated e-commerce component, but it is not currently utilizing this aspect of invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an illustration of prior art Powerpoint® or equivalent presentation view.

FIG. 2 is a schematic of prior art Quicktime® view.

FIG. 3 is a schematic of prior art Media Cleaner multimedia video adaption system.

- 5 FIG. 4 is a schematic of prior art example in which digital video and digital audio are synchronized.

FIG. 5A is a flow diagram of the method of digital media conversion and integration in accordance with one embodiment of the present invention.

FIG. 5B is a continuation of the flow diagram of 5A.

- 10 FIG. 6 is a flow diagram of the process involved in the alternate embodiment.

FIG. 7 is a block diagram of a digital media conversion and integration system.

FIG. 8A is a block diagram of the computer system that executes the digital media conversion and integration system.

- 15 FIG. 8B is a block diagram of the digital media conversion system interacting with the Internet and a personal computer.

FIG. 9 is a block diagram of an input handling module.

FIG. 10 is a block diagram of the digital media transformation module.

FIG. 11 is a block diagram of the digital media transform engine.

FIG. 12 is a block diagram of the digital media integration module.

- 20 FIG. 13 is a block diagram of the device building module.

FIG. 14 is a block diagram of the alternate embodiment with the personal computer media production module.

FIG. 15 is a flow diagram of the steps involved in the transformation module process.

25

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] In the following detailed description of the embodiments, reference is made to the drawings that accompany and that are a part of the embodiments. The drawings show, by way of illustration, specific embodiments in which the invention may be practiced. Those embodiments are described in sufficient detail to enable those skilled in the art to practice the invention and it is to be understood that other embodiments may be utilized and that structural, logical, and electrical changes as well as other modifications may be made without departing from the spirit and scope of the present invention.

DEFINITIONS

[0031] Throughout the description of the invention the following expressions are used:

“Proprietary format” indicates software file format which is controlled by a particular company.

“Platform format:” non-proprietary file formats, generally developed by industry groups, include JPEG, MPEG, etc. accessible by all users without software purchases or other licensing fees.

A “Digital media file” Any file which contains coded information which when decoded by executing media software will deliver sound, text, graphs, or, video that contains more than mere text or numerical manipulations.

“Module” is meant as a synonym for a code segment executable in computer language that will perform a series of function on data, which is usually self-contained and can be called by other modules or systems.

“Executable at X” means that the X system or X module calls a function or module.

“Code segment” is a series of instructions which can be compiled and executed by a computer in order to perform a set of functions.

“Low-level components” is a term used to describe the basic data structures which are extracted from data stored in particular software formats. For example a picture may be stored in a proprietary graphics file format in which superfluous information is contained when the picture is converted into pixel information which contains only information on pixel location, brightness and color.

In the specification the expression “module” is used, in the claims “code segment” is used. These terms can be interchanged, although “code segment” is broader than module in theory, because a code segment can be executed by any system. A module must generally be “called.

[0032] Referring now to FIG. 5A-B a method 900 for converting and integrating multiple digital media files is shown. In step 902 a user goes to a proprietary website through the Internet or other appropriate connection. After the user is connected to the website, an HTML script is loaded onto the user’s computer that allows a user to choose a desired media output in step 904.

[0033] In step 906, the system determines to make sure that it can deliver the desired media output. In step 908 if it cannot deliver the desired output it asks the user if the user wishes for another digital media output. If the user does not wish another output then the program exits in step 999, if user does the system is returned to step 904.

5 [0034] In step 910, the system asks the user for a device specific output like PDAs, regular web presentation, etc. The system determines if it can match the desired digital media output to the desired device in step 912. If there is no match, the system asks the user for another device specific output in step 913. If the system cannot deliver the desired output then the system is exited in step 999. Otherwise the program returns to step 910.

10 [0035] In step 914, the user chooses the desired inputs from a list of possible digital media inputs. In step 916, the system decides whether it can convert and integrate the possible digital media inputs. If the system can perform the conversion it proceeds to step 920, but if it cannot the system checks to see if it can convert the digital media format input to a format that it can convert to the desired digital media output in step 918. If it cannot it informs the use in step
15 998 and exits the program in 999.

 [0036] In step 920 the system prompts the user to a screen which allows the digital media input files to be downloaded to the system. The user attaches the files to such a prompt either by manual command or a special screen and downloads the files to the temporary storage server 418 in step 922. In step 924 the digital media input files are loaded into the input handler module
20 420. In step 926 the files are checked for security problems such as viruses and for uncorrectable file errors. In step 928 if the files contain viruses or uncorrectable errors, the system requests a new input from the user in step 930. In step 932, if the user answers that they do not have new input the system in exited in step 999. If the user has another digital media input file the system returns to step 920.

25 [0037] In step 934, the system determines whether the digital media input files are old versions, if they are and need updating then they are updated in step 936, if not they proceed to step 938 in which the system compresses the file for the conversion module.

 [0038] In step 940 the digital media files are processed by the digital media transform module 460. In step 944 the intermediate digital media file is converted to the desired output format. In step the 946 digital media output file is converted to the appropriate device. In
30 optional step 947 graphics, audio, and video is removed and/or transformed so that the output file may be viewed by lower memory devices, such as PDAs or handheld computers. In step 948 this digital media output is placed in the system server 492 for access by the user or other third parties. In step 950 the user is sent an appropriate connection tool to access the digital media or

to send to third parties. In another embodiment the user is simply emailed the digital media file if the user so determines that is appropriate delivery mechanism.

5 [0039] Referring now to FIG. 6, an alternate embodiment method for converting and integrating digital media files with authoring tools 1100. A preprocess step 1101 requires that the user loads the appropriate media software into the computer. In this example, the computer has been preloaded with Microsoft POWERPOINT®, but the invention may be used with other proprietary media platforms as well.

10 [0040] In step 1102 a user goes to an Internet site and chooses the link or icon to the appropriate authoring tool in step 1104. For example, the site may include links for software to author POWERPOINT®, Macromedia® FLASH®, simple XML, etc. In step 1106 the server that controls the Internet site loads the HTML (or XML) software connection on the user's computer and in step 1108 loads the software into the computer.

15 [0041] Alternately, in step 1109, the user simply loads the software the personal computer via CD-ROM or floppy disk. In step 1110, the user runs the install Wizard which checks in step 1111 to see if the appropriate software is loaded, if it is not the user is informed and the system is returned to step 1104. If the appropriate media software authoring is loaded then the user can press an icon to start the software in step 1112.

20 [0042] In step 1120, the authoring tool software loads a Powerpoint® or other appropriate media file into a buffer. In step 1122, the software places a template over the media file. In step 1124, the software gives the user a menu of choices of the format. In step 1126 the software executes the desired choice. If the user selects the powerpoint-audio option, in step 1130 the software executes instructions which either adds an audio file or in step 1132 allows the user to record an audio file while the Powerpoint® presentation is playing. In step 1134 the system adds any other media files to the Powerpoint® file. In step 1150, the user chooses the "upload" option, which connects the personal computer to system 1000 in step 1152. In step 1154 the software loads the modified file to system 1000, which then places the file in input handler module 1020 in step 1156. Steps 926-998 are then performed, but step 940 can be skipped.

30 [0043] Referring now to FIG. 7, a digital media conversion and integration system 400, which includes a first communications devices 402, a second communications device 404, and a customer request input page 406. The system also includes two distinct digital media files 410 and 412, respectively, which may be contained in one data storage file or two, an optional timing marker or timing information file 414, and an optional presentation support file 415. The system also includes an output media file 599 and presentation data 598.

35 [0044] The system includes a publishing manager module 450 which controls and schedules the entire process of converting, integrating and publishing and distributes the digital

media files 410 412, and 414, and 415 between the modules, temporary file storage 418, and a digital media input handler module 420. The system also includes a digital media transformation module 460, a device building module 480, an output communications device 490, a data storage 492, an optional network server 496 connected to an email delivery device 494 or an Internet connection 498.

[0045] A client desires to convert one or more digital media files, such as a Powerpoint® file and an audio file, 410, 412 into a presentation that can be accessed by third parties over the Internet 405 or a network server 496. The client uploads the media files 410, 412, and the optional timing and supplementary files 414, 415 to the system 400 via an Internet or email connection 402. The client also specifies which type of presentation output they wish to be accessed and what type of device in the customer input request page 406. The input request 406 is passed along to the Publishing Manager Module 450, which controls the overall process of the system 400.

[0046] The input handler module 420, checks and compresses the digital media files 410, 412 and then passes them along to the publishing manager module 450. The publishing manager module 450 adds the relevant information to the files 410, 412, such as the customer output request 406 to the files 410, 412 and passes files to the digital media transformation module 460.

[0047] The digital media transformation module 460, takes the two digital media files 410, 412, breaks them down into low level data components and then converts them to an intermediate format where two or more media files can now be integrated. The media files 410, 412 are integrated and converted again into the desired media output file 599. The media output file is then passed back to the publishing manager module 450 and if the file 599 is ready for output, it is passed to the device building module 480 where the file is made ready for the web, a PDA, etc., in a presentation format 598. The presentation 598 and the file 599 are then stored on a computer readable medium 492 and, at the client's direction downloaded onto a server 496 or placed in a location where the presentation can be viewed via the Internet or email 405. Each of the processes in modules 420, 450, 460, and 480 is detailed below.

[0048] Referring now to FIG. 8A, a digital media conversion system 400 which utilizes computer system 300, which includes a microprocessor 304, and which is coupled to a high speed local or memory bus 306 and an I/O bus 308. Of course, buses 306 and 308 are shown for the purposes of illustration and can be implemented in a variety of fashions. Coupled to the memory bus 306 is random access memory (RAM) 310 and read only memory (ROM) 312, both of which are instances of computer readable media. Coupled to the I/O bus 308 are a number of peripherals such as a keyboard 314, monitor 316, network card 318 and other computer readable media 320. The computer readable media 320 can take a variety of forms such as a hard disk

drive or optical read/write systems, etc. The microprocessor 304 typically operates under program control stored in the various computer readable media 320. System 400 is stored in the computer readable media 320 except for the communications devices 402 404, the communications system 490, the data storage 492, and the network server 496, which may be located on other computers.

[0049] Referring now to FIG. 8B, an expanded digital media conversion system 400, in which computer system 300 interacts with one or more customer personal computers 350 all of which are connect to computer networks 405, which is most likely the Internet.

[0050] Those skilled in the art of digital media programming would appreciate that the digital media conversion system 400 is a distributed system that runs on multiple platforms. Such as system is indicated by FIG. 6C, and such as system 400 may be implemented by a plurality of computer systems 300 which are connected by a network 390, which is usually the Internet 494, but can be one or more local area networks or a wide area network 496. The implementation of a distributed system allows the conversion system 400 to easily support the requirements of many different media formats and output players.

[0051] Referring now to FIG. 9, an input handler module 420, which consists of temporary data storage 424, a security checking module 426, a virus update module 427, a file error checking module 428, a file error correction module 429, a update test module 430, and a compression module 440.

[0052] The digital files are uploaded from the user's computer 350 through the Internet 405 to the temporary data storage 424. The data storage is kept apart from the rest of the modules in case the file is infected with a computer virus. The files are then run through the security-checking module 426 to determine if they are infected with a virus. If the files contain a virus that cannot be remedied, the user is notified via the Internet or email 405 that the digital media files must be replaced and reloaded. The security-checking module 426 is continually updated on new viruses and other computer infectants by the virus update module 427. If the files are not infected they are so marked and then placed on the in the file error checking module 428, where the digital media files are checked to see that they can be read and converted properly.

[0053] If one of the digital media files 410 or 412 contains an error that cannot be corrected by the system 400, the user is informed via the Internet or email 405 that the file must be corrected and reloaded. The digital media files also go through the update module 430 which checks to see if the media file is the most current version. If the version of the digital media files 410 and/or 412 is not current, then the system will update and convert to the most current version of the media using either a custom update system or actually activating the proprietary software.

[0054] After at least one of the files 410 and/or 412 has been updated to the most current version of the digital media file, at least one of the files 410 and/or 412 is then passed to the compression module 440 and compressed. Compression of digital media files is well known by those skilled in the art of media software programming and can be achieved in many different ways, including using proprietary compression software made by a third party and used under license. Please note that the file error checking module 428 and the update module 430 may be combined into one module, but their function are detailed separately for the purposes of enabling one of ordinary skill in the art to implement the invention.

[0055] Also included in the input handling module is an optional digital media update module 430, which consists of a media type sorter 432, and update checking module 434, and an update module 436. A digital media file 410 enters the update module 430, at which time it is encountered by the media sorter 432, which determines what type of digital media file it is (MPEG, Powerpoint, etc.). It then transfers the digital media file to the correct update checking module to determine if the file is in the most current version (or a version which can be converted by the system). It is current then the system exits the digital media update module 430 without altering the digital media files 410 and/or 412.

[0056] Referring now to FIG. 10, a digital media transformation module, 460, which includes digital media files 410, 412, a timing file 414, and a presentation support file 415, a customer output request 406, a media router module 462, a transform engine 464, which contains up to 15 media breakdown modules 502-516, an intermediate media file assignment module 466, a media integration and building module 470, which contains up to 19 output modules, 561-579, an presentation indexer module 468.

[0057] The digital media transformation module 460, also referred as the transform engine(s), is a series of complex computer code segments that are responsible for changing the incoming media files 410, 412 into the desired media output format 406. The incoming digital media data files (410, 412) are routed to the digital media transformation module by the publishing manager module 450 from the input handler module 420.

[0058] The transform engines 460 break the digital data media files 410, 412 into their low level components, translate the low level components into a intermediate format, and integrate the intermediate formats where possible. There are intermediate formats which will not be able to be integrated. Although, such situations would normally have been screened out by the input handler module 420 or the publishing manager module 450. The transform engines 460 also can take a timing file 414 or presentation support files 415 and breakdown their components in order to integrate them into the output presentation file so that two different media can be synchronized without further authoring.

[0059] The media router module 462 determines what format of media files 410, 412, 414, and 415 needs to be transformed to the desired output format 406 and transfers the data contained in the file to the appropriate media breakdown module in the transform engine 464, which contains all the individual breakdown modules. Table 1 below indicates how the media router module 462 will assign different media file inputs to desired input media breakdown modules, which is not meant to be a comprehensive list of all media formats covered by the present invention, but serves to illustrate how the media router module 462 assigns the digital media files to specific modules which will break down the particular format of the digital media file input into components which then can be integrated.

[0060] Although the specific media breakdown modules 502-516 are assigned to a specific input-output category as indicated by Table 1, a skilled computer programmer will realize that many of these media specific transformation modules 502-516 will use common algorithms 580 in order to transform the digital media file to the desired output (or desired multiple output formats, such as both XML and a Flash presentation).

[0061] The diagram in FIG. 10 of the transform engine 464 is depicted as one module, but is comprised of many smaller modules 502-550 and a common algorithm module 580, but each module may use some the same algorithms as other breakdown modules to perform the procedures necessary to get the incoming media files into an intermediate digital format. The modules can share algorithms because each individual "breakdown" procedure may have common characteristics with other "breakdown" algorithms, such a decompression, data structure recognition (i.e. color bit, grayscale bits, etc). Of course, particular media breakdown modules such as powerpoint breakdown module 502 have modules which will work only for the specific media file and cannot share specific algorithms. Other algorithms may include data pattern recognition algorithms which find data which fits a particular pattern and the module can recognize as a certain type of media input, such as a volume instruction on an audio file, or a color palette in a picture.

[0062] In some instances the Intermediate-level media will include timing signals extracted from the digital media files 410-412. This extraction can be supported by data in the digital media file itself, where such a file would inherently support a timing signal, such as the break between Powerpoint® slides. In other instances, a timing signal mechanism will be provided by an external file or a timing approximation module 548 which will provide the timing signals for synchronizing a portion of a audio file with a specific slide or a particular slide with an animation file segment. The presentation support module 549 will break down other information such as text or graphics which can be later integrated into the intermediate level digital file.

- [0063] Although the intermediate format of the converted media will usually be in Extensible Markup Language (XML), a skilled programmer will realize that different intermediate formats may be more appropriate for other digital media conversions. Such other intermediate formats may include platform-based standards (as opposed to proprietary standards like Real® Windows Media®) like M-JPEG, MP-3, etc. which are commonly utilized by commercial players and other Internet devices for media displays. The typical format for the digital media output of the will consist of a presentation-ready files like XML, DHTML, Flash®, Powerpoint® with add-ons, etc. Segments of digital video, graphics, and digital audio files are synchronized by the media synchronizer 478.
- [0064] As will be appreciated by those skilled in the art of computer programming, the present invention's ability to break down the digital media file into its components, allows for the manipulation of the resulting data structures to be reconstructed in a different scale. The break down and reconstruction algorithms also allow the present invention to support a greater number of output formats than any of the prior art is able to because reconstruction of the digital media is far more versatile. Additionally, because of these techniques, no other prior art is able to convert animations.

TABLE 1A- Module execution assignments for media file inputs and outputs

First Digital Media input	Second Digital media input	Third Digital Media Input	Intermediate format	Desired Output Digital Media	Module Assigned
Powerpoint®			XML	Flash ®	502
Audio file			proprietary	Flash ®	503
Audio Timing			XML	Flash ®	504
Animation Timing			XML	Flash®	505
Powerpoint®			XML	HTML/DHTML Presentation	502
Audio file			proprietary	Hotmedia (G.723)	503
Audio file			proprietary	Sun au	503
Audio file			proprietary	ADPCM	503
Audio			XML	HTML/DHTML	504

Timing				Presentation	
Animation			XML		505
Timing					
Supporting presentation information			XML	HTML/DHTML Presentation	506
Powerpoint®	Supporting presentation information			Database	507
Powerpoint®		Audio	XML	Flash® with audio	508
Powerpoint®		Audio	XML	HTML/DHTML Presentation	508
Star Office				HTML/DHTML Presentation	509
Powerpoint®	Flash®		None		510
Powerpoint®	Quicktime		XML		511
M-JPEG-A	Powerpoint		XML		512
M-JPEG-B	Powerpoint		XML		513
Flash®	Audio			Flash® with audio	514
Audio			None	Real	515
Audio			None	Windows Media	516

[0065] Referring now to FIG. 11, a digital media transform engine 464, which is comprised of specific media breakdown modules 502-516, a data bus 501, and a common algorithm module 580. Tables 1A and 1B indicate which formats can be broken down by the individual modules.

5 [0066] Referring now to FIG. 12, a digital media integration module 470, which is comprised of specific output format modules 562-580, and a data bus 471. Tables 2A-2E list the formats supported by the digital integration media module.

TABLE 2 A-E Output module format assignments.

10 A. Presentation format Flash® Player with 32k bits per second audio, Flash 4.0 or above plug in required for the viewer:

Intermediate	Secondary	Tertiary	Integrated-Converted	Module
--------------	-----------	----------	----------------------	--------

format	Intermediate format	Intermediate format	format	assigned
XML			® with animations	561
proprietary audio			32kbps MP3	562
Proprietary Audio	Flash®	Timing Information	Flash®	563
Flash	Proprietary audio	timing	Flash®	564

B. Presentation format Flash Player with 24k bits per second audio, Flash 4.0 or above plug in required for the viewer:

XML			Flash with animations	565
proprietary audio			24kbps MP3	566
Flash®	Proprietary audio	timing	Flash®	567A
Proprietary Audio	Flash®	Timing Information	Flash®	567B

C. Presentation format HTML/DHTML presentation with 8k bits per second audio, no plug-in required for the viewer:

XML	Timing		DHTML	568
Proprietary audio			Hotmedia (G.723)	569
Proprietary Audio	DHTML	Timing Information	DHTML and (G.723)	570

- 5 D. Presentation format HTML/DHTML player with 32kbs .au audio, no plug-in required for the viewer:

XML	Timing		DHTML	571
Proprietary audio			Sun au	572
Proprietary AudioAudio	DHTML	Timing Information	DHTML and Sun au	573

E. Other Output formats supported, with accompanying presentation format:

Intermediate format	Secondary Intermediate format	Tertiary Intermediate format	Integrated-Converted format	Presentation Format	Module Assigned
---------------------	-------------------------------	------------------------------	-----------------------------	---------------------	-----------------

XML	Timing		Flash®	Flash® with multiple audio rates	574
XML	Audio	Timing	Flash®	Flash® with real media	575
Flash	Audio		Flash®	Modified flash for PDA, with 32kbs sound	576
Audio			Real® Media		577
Audio			Windows® Media		578
XML	Audio	Timing	Flash®	Flash® with windows media	579

[0067] Please note that the above table is a list of format conversions and integration supported by the invention at the time of this patent application. The applicant's complex breakdown media modules 502-550 and integration modules 560-580 will be able to handle conversions for software not on the market at this time.

5 [0068] Additionally because the digital media files are stripped to their constituent components, the minimal amount of components can be combined to reconstruct an output presentation file. Thus, the present invention will use much less bandwidth than prior art to get the same quality of output presentation. For example if a frame only needs to have text "delivered" then the presentation will not send the entire graphic for a frame, whereas other
10 prior art would deliver the entire frame using more bandwidth.

[0069] Referring now to FIG. 13, a device building module 480, which contains an output router 482, a data bus 481, and various device output format modules 582, 583, 584, 585, 586, 587, 589, and 590. The output router module distributes the digital media output file 599 to every device building that that customer requested. Table 3 indicates which modules are assigned
15 based on the requested device. It is expected that multiple device output formats will be assigned at the request of the consumer.

Table 3 Output device builder module assignments:

Device Output format	Module Assigned
Powerpoint® with Audio, Internet presentation	582

Web presentation, no player	583
Web presentation with proprietary player	584
Cell/Digital Phone Screen	586
PDA Screen	587
MP3 Only	590
File storage only	585

5 [0070] The device-building module 480 puts the output digital media file in whatever presentation format was requested by the user when entered into the consumer request input 406. So if the user chose "all" in the consumer request input 406 for "devices to enable" then the device building module 480 determines which conversions the digital media file output can be placed into and would activate all available devices. The output file 599 travels along the data bus 481 in order to get to the specific module for conversion to a specific electronic device.

10 [0071] Such conversion technology is prevalent in "web clipping" software technology which allows complicated graphics and text to be displayed on device with very little memory or display capability, such as cell phones or personal digital assistants (PDAs). These web clipping applications do not convert complicated graphics for cell phones, but essentially remove graphics that would use too much display memory on such a device with limited memory. However, it may not be possible for all output formats to be available for all devices. For example, a cell phone screen simply would not have enough memory resources to display a Flash® output presentation file.

15 [0072] Referring now to FIG. 14, an alternate embodiment, a digital media conversion and integration system with authoring tools 1000. The system includes a personal computer 1001 connected to the Internet through a communications device 1004. The digital media conversion and integration system is connected to the Internet or other appropriate computer network 1005 through a communications device 1006. A software download manager 1008
20 stores the software to be run on a personal computer 1001.

25 [0073] Other components of system 1000 are similar to the system depicted in system 400, consisting of an input handler module 1020, a publishing manager module 1050, a digital media transformation module 1060, a device building module 1080 and communication system, 1090, data for digital media storage. Other delivery mechanisms include an optional web server 1096, which get files by a email system 1097 and a communications device connected to the Internet 1098. An executed install of the authoring tool software, results in the placement of authoring module 1040 install in personal computer 1001 memory 320 and executed by the CPU 304.

[0074] The digital media conversion and integration system with authoring tools 1000 resembles system 400 in many ways with one important distinction: software is downloaded from the digital media conversion system to a personal computer 1001 (or other appropriate authoring hardware device) and much of the conversion process takes place on the user's personal computer 1001, through the execution of the authoring module 1040 before the digital files are uploaded to the system 1008.

[0075] Referring now to FIG. 15, a detailed process digital media file breakdown step 940. In step 1202 a particular digital media file type is assigned to a particular breakdown module. In step 1204 the file is examined for picture primitives and the picture primitives are broken down into components. In step 1206 the file is examined for audio primitives and the audio primitives are broken down into components. In step 1208 the file is examined for text primitives and the text primitives are broken down into components. In step 1210 the file is examined for animation primitives and the animation primitives are broken down into components. In step 1212 the file is examined for graphics primitives and the graphics primitives are broken down into components. In step 1214 the file is examined for video primitives and video primitives are broken down into components. In step 1216 the file is examined for supporting material primitives and the supporting material primitives broken down into components.

[0076] In step 1230 the timing information recorded, all components derived from the primitives are marked with timing markers and indexed on an array. In step 1232 steps 1204-1230 repeated until the end of file is reached, and in step 1250 a search index generated based on timing markers and index arrays. In step 1252 the picture components are converted to intermediate level format. In step 1254 the audio components are converted to intermediate level format. In step 1256 the text components are converted to intermediate level format. In step 1258 the animation components converted to intermediate level format. In step 1260 the graphics components converted to intermediate level format, and in step 1262 the video components are converted to intermediate level format. Those skilled in the art will appreciate that there will be different methods which can implement the search, breakdown, indexing, timing marker placement, and converting functions.

[0077] Additionally, the invention allows the user to choose from a variety of payment options. In one embodiment a user can pay a monthly fee and become entitled to a set amount of presentations per month, or an unlimited amount. In another embodiment, the user pays a set amount, which can vary by format, and the user will be entitled to convert a digital media file. The invention allows for the use of a credit card number to be transferred and verified over the Internet as well for all of these payment options. Submitting financial information to any entity

about a credit card over the Internet to effect payment for services or downloadable software is well known to persons in the art, and although it is part of the present invention in one embodiment, it can be appreciated that this aspect can be executed in a variety of ways.

5 [0078] While this invention has been described in terms of several preferred embodiments, it is contemplated that alternatives, modifications, permutations and equivalents thereof will become apparent to those skilled in the art upon a reading of the specification and study of the drawings. It is therefore intended that the following appended claims include all such alternatives, modifications, permutations and equivalents as fall within the true spirit and scope of the present invention.

10

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203
2204